



FREQUENCY OF ASYMPTOMATIC DIASTOLIC DYSFUNCTION IN TYPE II DIABETIC PATIENTS WITH NORMAL SYSTOLIC FUNCTION

Muhammad Zaman^a, Abdul Mannan^a, Samra Haq^a, Muhammad Umer Farooq^a

ABSTRACT:

BACKGROUND: The incidence of Ischemic Heart Disease (IHD) is higher in diabetic patient as compared to general population. Diabetes is associated with increased cardiovascular complications, the most common of which are IHD and left ventricular dysfunction. Diastolic dysfunction has been described as an early sign of this diabetic heart muscle disease preceding the systolic damage.

AIMS: The purpose of this study was to determine the frequency of asymptomatic diastolic dysfunction in type II diabetic patient with normal systolic function.

Material and Methods: This was a cross sectional study conducted at outdoor patient department of Cardiology, Punjab Institute of Cardiology, Lahore during six months period. A total of 200 patients with type II diabetes mellitus of more than four years duration were studied. Echocardiography was performed to assess left ventricular diastolic dysfunction.

RESULTS: In our study, 15.50%(n=31) were between 40-45years, 31.5%(n=63) were between 46-50 years of the age and 53%(n=106) were between 51-55 years of the age, mean age was 49.84 ± 4.232 years, 55%(n=110) were male and 45%(n=90) were females, diastolic dysfunction was found to be higher among patients who had prolonged duration of type II diabetes mellitus as (78.40%).

CONCLUSIONS: Present study reveals high incidence of diastolic dysfunction in diabetic patients. Echocardiography must be done for early diagnosis and institution of treatment. This will reduce morbidity and improve the outcome, and prevent future heart failure.

KEY WORDS: Ischemic heart disease, left ventricular dysfunction, type II diabetes mellitus, diastolic dysfunction, heart failure

INTRODUCTION

Diabetes mellitus is emerging as an epidemic all over the world. It is one of the metabolic disorders which if not properly managed can lead to long term life threatening complications and premature deaths. There is 170% increase in the incidence of diabetes in developing countries as compared to 47% in developed countries. Prevalence of diabetes is high 13.14% in Pakistan¹. Diastolic dysfunction is a frequent finding in type II diabetes mellitus without sign and symptoms of heart disease and is presumably an early feature of diabetic Cardiomyopathy. Left ventricular diastolic function is affected earlier than systolic function in asymptomatic type 2 diabetes mellitus². It is reported that diastolic dysfunction remained an independent predictor of heart failure risk and that every unit of increase in $E/e' > 15$ was associated

(J Cardiovasc Dis 2013;11(4):97-100) with a 3% greater likelihood of the future development of heart failure.³

Asymptomatic diastolic dysfunction is more prevalent than symptomatic disease⁴. When present, the symptoms of diastolic dysfunction are indistinguishable from those of systolic dysfunction. These includes: diminished exercise capacity; development of edema; paroxysmal nocturnal dyspnea; and orthopnea. Because of the increased chamber stiffness, on exertion Left ventricular end diastolic volume (LVEDV) does not increase in patients with diastolic dysfunction, preventing the necessary increase in stroke volume. Therefore, exercise intolerance is often an early symptom⁴.

Diastolic dysfunction can be assessed by using Doppler echocardiography. Asymptomatic patients with diabetes and preserved left ventricular ejection (LVEF) may have diastolic dysfunction as assessed with echocardiography⁵.

Doppler echocardiography is a simple, non-invasive valuable tool in diagnosing diastolic dysfunction. In diabetics before they develop cardiac symptoms it has to be done routinely on every diabetic patients to assess the cardiac function⁶.

^a Punjab Institute of Cardiology,
Lahore-Pakistan

* Corresponding author:
Email: drmuhammadzamanfayyaz@yahoo.com



In literature, diastolic dysfunction was reported in 64% patients of diabetes mellitus (DM)⁷.

Another study reported a significant association between diabetes mellitus (DM) and diastolic dysfunction (DD). The reported frequency of asymptomatic diastolic dysfunction in DM patients was 54.33%⁶.

MATERIALS AND METHODS

The objectives of our study

- To determine the frequency of asymptomatic diastolic dysfunction in type II diabetic patients presenting with normal systolic function.

Inclusion Criteria: Patients with type II diabetes mellitus with duration >3 years of age 40-55 years of either gender, presenting with preserved left ventricular systolic function (LVEF: $\geq 50\%$) on echocardiography.

Exclusion criteria: Patients with hypertension (Blood Pressure >140/90mmHg), Chronic Renal failure (serum creatinine >1.2, blood urea > 50 mg/dl), patients with evidence of Chronic Liver disease, Cardiomyopathy, Coronary artery disease (excluded by history of angina, chest pain, electrocardiogram changes) and patients with evidence of valvular heart disease.

Diagnostic criteria: It will be labelled if any of the following findings will be observed on echocardiography at the time of admission:

- Early diastolic rapid filling (E-wave) and atrial contraction late filling (A-wave) velocities ratio (E/A ratio) <1 or >2. Stage 2 differentiated by E/e' ratio >15.
- Deceleration time (DT) <150 or >250ms.
- Isovolumetric relaxation time (IVRT) <60 or >100ms, and
- Ejection fraction >50%

RESULTS:

A total of 200 cases fulfilling the inclusion/exclusion criteria to determine the frequency of asymptomatic diastolic dysfunction in type II diabetes mellitus with normal LV systolic function.

In gender distribution of the patients 55 % (n=110) were male and 45 % (n=90) were females. (Table 1)

In age distribution of the patients 5.50 % (n=31) were between 40-45 years, 31.50 % (n=63) were between 46-50 years of the age and 53 % (n=106) were between 51-55 years of the age, mean age was 49.84+4.23 years. (Table 1,2)

According to duration of diabetes mellitus distribution, 63 % (n=126) patients had duration

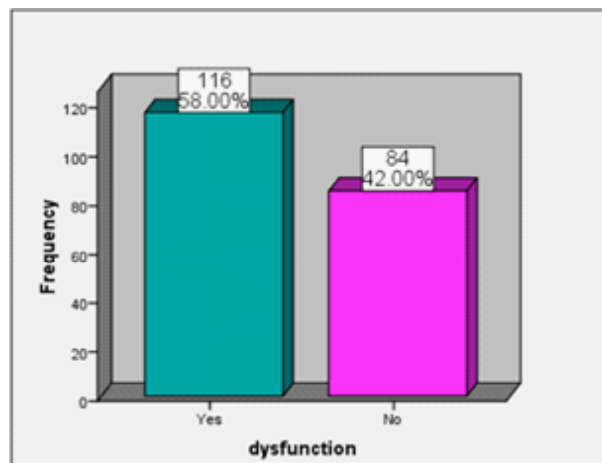
Table-1: Descriptive Characteristics

Variable		Frequency (%)
Gender	Male	90(45%)
	Females	110(55%)
Age		49.80±4.23
Duration of diabetes mellitus (years)	4-9 Years	126(63%)
	10-14 Years	74(37%)
BMI	≤ 30	137(68%)
	>30	63(31.5%)
Smoking		84(42%)

Table-2: Patient characteristics with respect to distribution of Diastolic dysfunction

Variables		Diastolic Dysfunction		P-value
		YES 116(58.0%)	NO 84(42.0%)	
Gender	Male	64(58.2%)	46 (41.8%)	0.920
	Female	52(57.8%)	38(42.2%)	
Age	40-45	14(45.2%)	17(54.8%)	0.394
	46-50	33(52.4%)	30(47.6%)	0.297
	51-55	69(65.1%)	37(34.9%)	0.041
Duration of diabetes	4-9 Years	58(46%)	68(54%)	0.001
	10-14 Years	58(78.4%)	16(21.6%)	
BMI	≤30	73(62.9%)	64(76.2%)	0.066
	>30	43(37.1%)	20(23.8%)	
Smoker		63(75.0%)	21(25.0%)	0.001

Figure-1: Graphical distribution according to diastolic dysfunction.





of diabetes mellitus between 4-9 years and 37 % (n=74) had between 10-14 years. (Table 1)

Frequency of diastolic dysfunction was recorded in 58 % (n=116) while 42 % (n=84) had no diastolic dysfunction. (Figure 1)

In stratification for gender out of 116 cases of diastolic dysfunction, 64 were male while 52 were females, p value was 0.92. (Table 2)

In stratification for age out of 116 cases of diastolic dysfunction, 14 were between 40-45 years of the age, 33 were between 46-50 years of the age and 69 were between 51-55 years of the age. (Table 2)

In stratification for diabetes mellitus out of 116 cases of diastolic dysfunction, 58 had duration of diabetes mellitus between 4-9 years and 58 had duration of diabetes mellitus between 10-14 years, p value was 0.001. (Table 2)

DISCUSSION

Cardiovascular disease (CVD) currently accounts for nearly half of noncommunicable diseases (NCDs). NCDs have overtaken communicable diseases as the world's major disease burden, with CVD remaining the leading global cause of death, accounting for 17.3 million deaths per year, a number that is expected to grow to >23.6 million by 2030.⁸

It is stated that diastolic heart failure (DHF) is a clinical syndrome in which patients have symptoms and signs of heart failure (HF), normal or near normal left ventricular (LV) ejection fraction (EF), normal or near normal LV volume and evidence of diastolic dysfunction (eg, abnormal pattern of LV filling and elevated filling pressures. The prevalence of heart failure with preserved ejection fraction (HF-PEF) and diastolic heart failure (DHF) increases with age.⁹

We planned this study on patients with Type II diabetes mellitus to see the frequency of asymptomatic diastolic dysfunction with normal left ventricular systolic function. Secondly it may help us to find high risk patients who need early intervention & more aggressive treatment thus reducing the

morbidity and mortality.

Diastolic dysfunction is the most prominent characteristic of diabetic cardiomyopathy. The Framingham Study firmly established the epidemiologic link between diabetes and heart failure¹⁰.

We found agreement of our findings with a study done by Patil et al the diastolic dysfunction was 54.33% and had a higher prevalence of diastolic dysfunction in patients with longer duration of diabetes mellitus⁶. Further study by Poirier P et al found 60% diastolic dysfunction in diabetic patients, which is higher than our study. Another study by Patil MB et al reported higher diastolic dysfunction in patients of diabetes mellitus as (64%)⁷, showed dissimilar results due to small sample size.

It is well observed that asymptomatic diastolic dysfunction is more common than symptomatic diastolic heart failure. Our results showed that the trend toward diastolic dysfunction was found to be higher in 51-55 age groups as (65.1%). The prevalence and severity of diastolic dysfunction increase with age and the development or worsening of diastolic dysfunction is associated with an increased risk of HF¹¹.

Unfortunately, limited studies have yet been carried out in Pakistan. Our study is the one of its kind in Pakistan to evaluate the frequency of asymptomatic diastolic dysfunction in type II diabetic patients. Our study showed higher prevalence of asymptomatic diastolic dysfunction in type II diabetes mellitus. Further studies should be done to probe into the association between asymptomatic diastolic dysfunction and type II diabetes mellitus, which could help us in better management of the patients with diastolic dysfunction in future.

CONCLUSIONS

Overall prevalence of diastolic dysfunction is high in type II diabetic patients. Asymptomatic diastolic dysfunction is more prevalent in patients who had prolonged duration of diabetes mellitus. The early diagnosis and treatment for diastolic dysfunction must be instituted to reduce the morbidity and improve the outcomes of diastolic heart failure.



REFERENCES

1. Zafar J, Bhatti F, Akhtar N, Rasheed U, Humayun S, Waheed A, et al. Prevalence and risk factors for diabetes mellitus in a selected urban population of a city in Punjab. *J Pak Med Assoc* 2011 Jan; 61(1): 40-7.
2. Shrestha NR, Sharma SK, Karki P, Shrestha NK, Acharya P. Echocardiographic Evaluation of Diastolic dysfunction in asymptomatic type 2 diabetes mellitus. *J Nepal med assoc* 2009;48(173):20-3.
3. From AM, Scott CG, Chen HH. The development of heart failure in patients with diabetes mellitus and pre-clinical diastolic dysfunction a population-based study. *J Am Coll Cardiol*. 2010 Jan 26;55(4):300-5
4. Kapila R, Mahajan RP. Diastolic dysfunction. *Continuing Education in Anesthesia, Critical Care & Pain*. 2009; 9(1):29-33.
5. Ross CJ, Scholte AJ, Kharagjitsingh AV, Bax JJ, Delgado V. changes in multidirectional LV strain in asymptomatic patient with type II diabetes mellitus: A 2 year follow-up study. *Eur Heart J, Cardiovasc Imaging*. 2014 Jan; 15(1): 41-7.
6. Patil VC, Patil HV, Shah KB, Vasani JD, Shetty P. Diastolic dysfunction in asymptomatic type II diabetes mellitus in normal systolic function. *J Cardiovas disease res*. 2011; 2(4):213-22.
7. Patil MB, Burji NP. Echocardiographic evaluation of diastolic dysfunction in asymptomatic type II diabetes mellitus. *J assoc Physicians India* 2012; 60:23-6.
8. Cardiovascular Diseases. WHO Report. www.who.int/cardiovascular_diseases/about-cvd/en/.
9. Bhuiyan T, Maurer MS. Heart Failure with Preserved Ejection Fraction: Persistent Diagnosis, Therapeutic Enigma. *Curr Cardiovasc Risk Rep*. 2011 Oct;5(5):440-449.
10. Kannel WB, Hjortland M, Castelli WP. Role of diabetes in congestive heart failure: the Framingham study. *Am J Cardiol* 1974; 34(1): 29-34.
11. Zile MR, Brutsaert DL. New concepts in diastolic dysfunction and diastolic heart failure: Part I: diagnosis, prognosis, and measurements of diastolic function. *Circulation* 2002; 105(11):1387-93.